Vol. V. No. 13. June 18, 1908.

THE JOURNAL OF PHILOSOPHY
PSYCHOLOGY AND SCIENTIFIC METHODS

THE FUNCTION OF IMAGES[1]

I. *Introduction.*—As genetic psychologists, it may be well for us to consider for a moment how this discussion arises and how it is that I occupy the position of opening it. From time to time there has been incidental, but sharp, opposition between certain members of this society as to the functions of images. Two members (there may be others), Dr. Rivers and myself, have protested that images do not perform certain alleged functions in our mental processes, because we haven't any images worth considering. In a paper read at the last meeting of the society, a member referred to this and put forward a friendly challenge that Dr. Rivers or myself should read a paper on what we considered to be the function of images. The position is illustrated by the following story:

THE FOX WITHOUT A TAIL. A PSYCHOLOGICAL FABLE

Early in the twentieth century, among a small society of learned foxes, there were one or two who had no tails. Several times in the year these foxes met to discuss the prey they had captured in the intervals, and many references were made to the value of their tails (which, in some of the members, were very large and bushy) in hunting it down. Some said that if they wished to do a new and clever trick, they made a preliminary experiment with their tails, and so clearly saw what was wanted. After which, with a voluntary jerk or let-go, they performed the action which their prescient tails had foreshadowed. As a means of comparison, too, the tails were said to be very useful. A really observant fox, when he looked at something and wanted, later on, to compare it with something else, found it very useful to think of his tail in between. Some even asserted that one could not recognize anything unless the activities of his tail came into play and helped out the sensations of the present moment.

[1] A paper read at University College, London, January 25, 1908, at the annual general meeting of the British Psychological Society. The lecture form is preserved.

The tailless ones asked how all these things could be, since they could do new and clever tricks as well as the others; they could compare things as well, and knew what was what as well as the rest did. And yet they had no tails at all, that is, not in the daytime; they might have suspected themselves of a tail or two at night just before going to sleep.

After a time they waxed bolder and declared, not only that they did not need tails to do these things with, but that the others, though they thought they did them with their tails, did not really do so, and that the tails, on which they prided themselves so much, were actually in the way. The best thing, they thought, for all foxes to do would be to get rid of them.

At this stage it was suggested that one of the tailless ones should explain, by the use of actual examples, precisely what he thought the others did with their tails. Rashly, he said he would, and the rest smiled, for they knew best what they did with their own tails.—*After Esop.*

II. *Some General Considerations Against the Older Theory.*—The first great difficulty in the way of the older theory of the function of images is the existence of persons who have none or almost none without, apparently, any disturbance in their normal mental life. If that theory as to the use of images in perception, comparison, and voluntary motion were true, such persons should be found only in asylums or schools for the mentally defective. They have not yet, apparently, all been incarcerated.

Not only are the imageless ones not defective intellectually, they do not even appear to be inferior. Galton, for example, found men of science (they were not psychologists) deficient in imagery as compared with other people. One remembers the "boat" which the young lady decked out with pretty colors, fair dames, and noble squires, when all that he had said was, "I want to tell you about a boat." We can suppose the feeling of contradiction and loss of power in readjustment which would arise if the subsequent narrative refused to coalesce with this image. His male listener lapsed into no images, his unspoken attitude being, "Go on, the boat will a good deal depend on what comes next."[2]

Perhaps, however, it would now be admitted that images are not essential to conceptual processes. It would not, however, be so readily admitted that they may be a hindrance. "A fellow-student of mine at Cambridge, a great visualizer, was much distressed by a 'bale of cotton on a wharf,' which popped in view whenever the word wealth appeared, and became the King Charles's head of his

[2] Winch, "Problems in Education," p. 49.

papers in economics."[3] And many of my hearers can doubtless supply similar cases from their own experience.

III. *Suggestions to Account for the Great Vogue of the Older Theory.*—If there is any relevance at all in the considerations above adduced, how do we explain the great vogue of the opposite belief? With reference to percepts, I suggest the following explanation:

"Past process certainly modifies present process; of that there is no doubt." We see more in a thing this time because we have seen it before, and we see more easily what we have seen before. If we observed wrongly the first time, error will tend to perpetuate itself and we are likely to go wrong again. "Thus, when the question arises as to the way in which this influence is exerted, what more likely than that attentive inquiry, fixing itself retrospectively on past processes, should give rise to images, which we accept as what *must* have made our present percepts what they are."[4] Again, if we fix our attention on the present process of perception and try to separate its stages, images do arise with most of us. Thus, the belief in the potency of the image may be, to some extent, a product of the psychologist, who, in stopping the process to examine it, has altered the process itself. Introspection, if it is to be successful, should watch and analyze the process as it normally goes on.

The case is somewhat similar with respect to memory. When, for psychological purposes, we try to remember something, images frequently arise. But do they when, as in ordinary life, we remember for a purpose, or do they in school or college when we remember to reproduce? And, if they do, how much do they help us?

In the case of voluntary movement, our present belief is largely owing to the schematic simplicity of the current view, namely, that voluntary movement arises when we "will" that an "image" of movement shall become realized. "You *must* have an image of the movement, or how can you know what movement to make?" That has been the substance of many replies to me during the last few years. To those who do not feel its cogency, I can only say that, in the days when I thought more of what is called "logical priority" and less of psychological sequence, that argument seemed to me to be perfectly sound.

I now pass to a detailed analysis of the alleged work of images in various mental processes.

IV. *The Function of Images in Perception.*—Perception, as you all know, was held to be a compound of image and sensation. One great difficulty in the way of this belief is the moral certainty of

[3] *Ibid.*, p. 48.
[4] *Ibid.*, p. 45.

accurate perception in lower animals, such as fishes, who are not believed to have any images at all. A second difficulty is that we can recognize things of which we can form no images, and which, indeed, we may have quite forgotten. *Quite* forgotten? Yes, not only could we recall no image of them, we should not know what to answer if we were questioned as to their very existence. I remember this conclusion flooding my mind, when, for the second time, I walked down the road from Bournemouth and came in sight of the church at Poole. I recognized it at once, the percept came familiarly to mind. I knew I had seen the church the preceding year; but I knew also that not only could I not have imaged it, but that if I had been asked in the interval whether there *was* a church at Poole, I should have answered that I did not know.

I will take a further illustration, which will probably appeal to the personal experience of every one of my auditors. We can perceive that a change has been made, say, in the furniture of a room, and can often tell what that change is, even though we could, had we been asked, have formed no image of its contents, nor, indeed, have stated what they were.

Passing on to later perceptual stages, in which I do not deny that most of us *can* call up images of past experiences when experiencing present sensations, the question to ask is, Do we do so? Do we, when seeing a yellow shape of a certain size, call before us images of taste and smell and weight, and then say, "Orange"? I use the orange because it is suitable to the season, and because it is a fruit much loved by English psychologists. Professor Stout, in his lectures, used to illustrate a similar question about perception with a candle, doubtless to throw light on the orange.

The genesis of the older view is, I suggest, explained thus: There seemed to be association of some sort, so, of course, it was regarded as "association of ideas"; they were the only sociable mental elements in early psychology, and "ideas" were tantamount to images. But this point need hardly be labored. It is now generally admitted that the formula for association is a much bigger thing than the old formula for the association of ideas. The present sensation does tend to revive something resulting from the past sensations with which it was previously complicated. These revivals can not be sensational, it is held, since the external world is not influencing us with the appropriate stimuli. For example, the yellow round thing may not be an orange after all, or, if it is, we may not be near enough to smell or bite it; or the light of the candle may be a light that fails.

Yet we expect the thing to taste like an orange; we expect the candle to light properly. And how can we do these things unless

we have images of taste and vision, with which to help out the present sensations and make up our percepts?

This seems, on the face of it, good argument. It has been deemed so secure that much systematic thought has been based upon it. It is sometimes called the application of an ideal content to reality—an English, *not* an American, definition of perceptual judgment.

Two cockneys, at the "Zoo" recently, were looking at a mysterious bird. "It's a heagle," said one. "Garn away," said the other, "it's a howl." "I beg your pardon, gentlemen," said the official in charge, "you are both wrong; it's an 'awk." If any one chooses to believe that either of these perspicuous persons went through the process of calling up images of past experience to aid his present sensations before he said, "heagle," "howl," and "'awk," I will not, for the moment, gainsay his belief. Probably, however, no one here would now maintain that position. It would be said that residua of past experiences, though fragmentary, inexact, and vague, had given rise to a something mental which, though it could not be "imaged," was an "idea" of some kind or, more grandiloquently, an "ideal content." Let me, for the present, admit this, noting the acquiescence to the proposition that there may be perception, accurate and inaccurate, prompt or hesitant, without imagery.

There is another difficulty in the way of the sensation plus image theory of perception, and that is the rapidity of perception as compared with the slowness of imagery. It is, I think, not disputed among persons accustomed to introspection that the images of past sensations, which are supposed to help out the present ones, come slowly flickering by, waxing and waning like a corps of ghosts, *after* we have classed the present instance, that is, *after we have perceived* the orange and the candle, *after we have applied* "our ideal content to reality."[5]

Still, all this might be admitted and yet a case might be made out for the use of imagery in perception.

It might, perhaps, be said that imageless persons are impatient people who draw bows at a venture. Images, like other spiritual beings, will not always strive with us, if we ignore them and hurry on without waiting for what they would teach us.

Nor, it might be said, ought we to draw any inferences from the mental processes of the London ornithologists referred to; they just guessed, except the keeper, and he had read the name on the ticket affixed to the cage.

[5] Several persons thoroughly competent in introspection assure me that images arise in perception which synchronize with the perceptual judgment. I have found no one who asserts that they precede it.

And, then, a serious professional charge winds up the indictment. To the imageless ones, it is said, "If you were capable of proper introspection, you would find these images you say you are without, and see for yourselves how much they aid perception." They, however, say they are without them, and adhere to that statement.

V. *The Function of Images in Comparison and Memory.*—Whilst some persons assert that they have little or no imagery and others that their every process of thought is attended by it, there is a third class who have imagery when they try to, and not usually otherwise. One such person, Mr. F. N. Hales, in some work at Cambridge, which both Dr. Rivers and Mr. McDougall know more in detail than I do, tried to find out how far imagery helped him in accuracy of memory and comparison. He set himself to remember and classify a number of grays of varying intensity. One of these would be exposed, and he would, subsequently, from memory, identify it or place it in a series. Sometimes he would do this after calling up a visual image and holding it steadily before him; at other times he would do it without employing imagery. It is what Americans call a conservative conclusion to say that he was just as accurate without the intervention of images as with them.

Two observers, Dr. W. G. Smith and Miss S. C. M. Sowton, in some carefully conducted experiments related in the *British Journal of Psychology*, Vol. II., Part 2, May, 1907, have some pertinent remarks on the relation between imagery and comparison. The subjects observed standard or pattern lines and afterwards marked off, from given lines, lengths equal to those observed. They say:

"In the course of the experiments we were struck by the entire absence of an image or mental picture of the line during the determination of the length of the reproduced line: in this respect we can only, so far as our work goes, confirm the view, upheld by Schumann and others, that in the comparison which is involved in the judgment that two successive impressions are equal, or different, a *Gedächtniss* or *Vorstellungsbild* is not essential and is normally absent."

It may, perhaps, be added that one of the observers judged rapidly and decisively; the other was hesitating and oscillating; but in neither case was any imagery present.

In a recent paper in the JOURNAL OF PHILOSOPHY, PSYCHOLOGY AND SCIENTIFIC METHODS,[6] Professor Thorndike has described a definite test as to the influence of imagery on visual memory. A large class, 200 in number, of adult students were asked to classify themselves as visualizers on the Galton plan, working in accordance with the following instructions: "You are to think of your breakfast table this morning and consider carefully the picture that rises

[6] "On the Function of Visual Images," Vol. IV., p. 324.

before your mind's eye. You are then to write down your answers to the first three questions on the list, using Galton's scale." The questions were:

1. Is the image dull or fairly clear? Is its brightness comparable to that of the actual scene?

2. Are all the objects pretty well defined at the same time, or is the place of sharpest definition at any one moment more contracted than it is in a real scene?

3. Are the colors of the china, of the toast, bread-crust, mustard, meat, parsley, or whatever may have been on the table, quite distinct and natural?

The students, by reading Galton's descriptions of each grade or group, rated themselves in grades from one to ten. Professor Thorndike took those who rated themselves 1, 2, 3, 4, 5 as the upper division, and those rating themselves 8, 9, 10 for his lower division, as these contained, approximately, the upper and lower thirds of the class numerically.

This is not so imperfect a method as it may seem to us at first sight, since American students at Teachers College and elsewhere are what ours decidedly are not, namely, psychologically minded; and, though there are obvious difficulties in obtaining any very exact results on this plan, one could probably be fairly sure that the upper third were generally better provided with images than the lower third.

To all these students Professor Thorndike put a series of questions as to objects which they must have seen in the course of their daily lives. How many pillars are there on a certain front of Columbia Library? How does a well-known lecturer part his hair? Does he wear a stand-up or turned-down collar? The answers were marked, the results tabulated, and the best and worst thirds compared. I should, myself, have preferred to see a table showing individual marks for imaging and for the visual memory tests, but the Galton method does not lend itself to that. However, there seemed little doubt that the students, poor in visual imagery, remembered just as well as those whose imagery was abundant.

The experiment is so valuable and important that one wishes it were more conclusive than it is. There is, of course, this difficulty in accepting the answers to Professor Thorndike's questions as evidences of memory. One does not know whether these students had ever "seen" the pillars or the lecturer's collar at all, in any proper sense of the word "seen." We may infer that they must have had certain sense impressions; we can not be sure that these ever became either perceptions or sensations.

Making all necessary deductions, however, the general result of

the experiment seems to me noteworthy, and the whole scope and method of it very characteristic of Professor Thorndike, who usually tackles a psychological question in a way to excite general interest, and especially the interest of his students, who are prospective teachers of one kind or another. In England, we shall, doubtless, on this question as on many others, find our lecturers on educational method beginning to instruct our teachers to practise their pupils in visual imagery, just after psychologists have decided, if they do thus decide, that it is futile.

Perhaps a very brief reference to some recent experiments of my own with school children may be admissible. Certain designs were exposed to view for a minute or so. The boys were required to look fixedly without movement. The designs were removed, and then drawn by the pupils from memory. Errors were marked without reference to dexterity in drawing, and, on the basis of these marks, the boys were divided into two equal groups, *A* and *B*. Four weeks later some fresh designs were shown, group *B* being required to reproduce, after giving a minute or two to the formation of a visual image, whilst group *A* formed no images, but reproduced at once. The table of marks shows that the group *B* as a whole and the sections of which the group was composed were inferior in every case to group *A* and its corresponding sections.

One week later, without warning, and without again seeing the designs, groups *A* and *B* were tried in order to see how far the process of forgetfulness had gone. Group *B* was again allowed a minute or two before each drawing to make visual images: group *A* made no images. The result was that, whilst group *A* of 18 children made 631 errors, group *B* of 18 children made 633 errors. And that this result is not adventitious may be seen by comparing the corresponding sections into which the groups are divided. In other words, the process of mnemonic decay had gone equally far in both groups: the visualizing of group *B* was not helpful in prolonging the memory of form.

I will anticipate the obvious criticism as to whether all the boys of group *B* did make visual images, or could do so. During the last test these boys were asked, as they were seated with eyes closed and hands over their eyes, whether they could see a picture of the design. Fifteen unhesitatingly said they could, three said they could not; these latter may have meant only that they could not remember that particular design, but I do not think so, as they all drew something more or less like it.

Another obvious criticism is that I have taken for granted that the boys perceived the designs rightly, though all made some errors in remembering them. The point is well taken, but I incline to

think that these boys, consisting of the first class in a good school, did perceive rightly. However, if they did not, there is no reason to suppose that bad observation gave us more errors in one group than in the other.

Again, we can not be sure that no boy in group *A* was guided in his drawing by the presence of a visual image, but we can fairly argue that the instructions to the boys of group *B* to try to form mental pictures and the time allowed before each drawing for them to do so would give us, at least, a great preponderance of imagery in that group.

On the whole, it is difficult to resist the conclusion that the visual imagery was without influence in the mental preservation of the designs.

Table, showing groups *A* and *B* divided into corresponding sections, *i. e.*, sections obtaining identical average marks in the preliminary test.

December 16. Marks for Preliminary Test. Number of Errors.	Number of Boys.	December 16. Preliminary Test. Average Number of Errors.	January 13. Average Number of Errors.	January 20. Average Number of Errors.
7, 8, 9	Group *A* 3	8.0	8.3	29.0
	Group *B* 3	8.0	12.3	24.0
10, 11, 12	Group *A* 3	11.0	16.3	31.6
	Group *B* 3	11.0	19.0	30.6
13	Group *A* 3	13.0	16.6	28.0
	Group *B* 3	13.0	18.3	34.0
14, 15	Group *A* 4	14.5	25.5	40.0
	Group *B* 4	14.5	29.5	41.2
16 to 24	Group *A* 5	18.6	30.8	41.0
	Group *B* 5	18.6	31.2	40.4

Group *A*, 18 in number, made 247 errors in the preliminary test of December 16, 1907, 380 errors in the test of immediate memory on January 13, 1908, and 631 errors in the test of continued memory on January 20, 1908.

Group *B*, 18 in number, made 247 errors in the preliminary test of December 16, 1907, 423 errors in the test of immediate memory on January 13, 1908, after time had been allowed for the formation of visual images, and 633 in the test of continued memory on January 20, 1908, again after time had been allowed for the formation of visual images.

We need not, however, wholly depend on such experiments as these. If we can get a friend, who is or is not a visualizer as we may require, we can by suitable questions extract much relevant information. An unusual advertisement was seen a week or two

ago by a lady and myself, "We don't keep Skipper Sardines, we sell them." "Where and when did you last see that?" she said. I mentioned a crossroad off the Worcester main road near Droitwich, at Easter, 1905. "What was the shop window like?" I told her. "Yes," she said, "I can see a picture of it." We seemed equally good at calling up details, at which the lady was surprised because I could not see a mental picture of it, and she could. This is not conclusive, because my visual memory is a little better than hers, but I think it suggestive. Much of my information about visual images has been obtained from this lady, who has, however, at length, told me that she will be glad when I get some of my own.

VI. *The Function of Images in Voluntary Motion.*—Popular though the image has been as helping perception, as making comparison possible, and in assisting visual memory, all these uses sink into insignificance before its great function as the "cue" for voluntary motion.

When reading my first book on psychology, I was spending part of almost every day playing baseball (not the American game, but one more like rounders) with some schoolboys. Very complex contortions have to be made, when between bases, to avoid being hit by the ball; and especially in order not to assume an irrevocable position when, as was almost always the case, one or more feints were made before the ball was thrown at one. The speed of bodily adjustment required was very great. Many of these boys had never played the game before, and if they formed images of the movements they were going to make before they made them, and then, so to speak, actualized the images, all I can say is that they possessed images of a rapidity and minute exactitude such as, I believe, no one has ever claimed for normal persons. Professor Herkomer, a week or two ago, spoke of one or two painters who could paint from their visual images; but they, he said, trembled, as it were, on the verge of madness. But compare, for a moment, the difficulty of guiding your brush by a static image seated in a chair, and guiding your movements in a romping, exciting game by images of yourself performing actions which you have never done before, to escape a moving object which has never before tried to trick you in just that way. From that moment I doubted the image theory of voluntary movement and, though I had resolved never to write about anything but school children, a friendly challenge from the other side has induced me to break my resolution; hence this paper.

It has, of course, never been shown that persons whose imagery is abundant can learn new movements more quickly than others whose imagery is poor, but such a scheme looks reasonable enough

and provides us with something mental to work with. Such characteristics are all that can be asked of any psychological hypothesis so long as it only advances claims to consideration, but when, in the absence of verification by experiment, the hypothesis is asserted as a fact, those who hold different views are entitled to complain.

There is, however, one thing satisfactory about psychology nowadays; we have got to the stage in which, whatever our opinions, we are ready to put them to the proof by actual tests, or, at least, to let another fellow do it.

The best work I know dealing definitely with this point is that of Professor Woodworth in the recent memorial volume to Professor Garman, of Amherst. Perhaps I may be allowed to use some sentences from my own review of his work in *Mind* of July, 1907.

"He groups psychological opinion on this matter into two divisions; one, which holds that the direct 'cause' of a voluntary movement is always a kinesthetic image; another, which holds that any image of the results to be gained by the movement may constitute its 'cue.' With thirteen subjects, most of them practised in introspection under test conditions, he put these positions to the proof." He worked on the voluntary execution of familiar movements, such as those of opening the mouth, winking, flexing or separating the fingers, or of some simple movement with scissors or forceps. Sometimes choice was permitted, *e. g.*, a reaction to a sound was to be made with either hand. Most of the movements were purposely hesitant; some, however, were made promptly. "Nearly one half of the experiments, 128 in number, showed no imagery; the kinesthetic image was observed in only one fifth of the cases and only half of these showed adequate images, *i. e.*, images which were fair representations of the actual sensations of the movement."

Frequently, the subject was surprised by the contrast between the actual sensations of the movement and its anticipatory kinesthetic image. I want to ask here if we ought to be surprised, if the one is an image and the other a sensation. I suppose we ought, in the same sense as when we say, after visiting a place we had heard about, but had not seen, "That's not the place as I imagined it"; but certainly not in any other sense.

But, obviously, these familiar movements are just the ones in which, even if imagery were ever largely operative, we should expect, on the general principle of the lapsing of intermediate and transitive states, that it would have died down.

Bair, however, took a case of the acquisition of new movements and taught several persons to move their ears at will, and Professor

Woodworth made some experiments on himself in isolating the extension and flection of the big toe from that of the other toes. Again, kinesthetic images did not seem necessary.

But these are endeavors to revive movements, the apparatus for which is in process of atrophy. They are movements out of the normal evolutionary track. Can they be regarded as typical of the acquisition of new voluntary movement?

Kirkpatrick and Trettien have given cases of children suddenly beginning to walk when stimulated by some object on which their attention was fixed. There was no appearance of attention to kinesthetic imagery in these cases. A swallow which had fallen out of a nest flew perfectly, so far as I could tell, when first let out of a very small cage in which I had put him, in order to watch this point. He certainly flew without the preliminary flutterings and little trials which he would otherwise have made from the edge of his nest. Cases like this seem to render the employment of the kinesthetic image unlikely.

But even these illustrations do not seem to me conclusive as to the learning of those movements which, without definite application and protracted effort, we should never make at all. Such movements are writing, playing at billiards, playing at golf. Walking, to man, and flying, to birds, come in time without practise. Moving our ears and separating our toes have gone from us. Are such movements properly comparable with those which we should never acquire and never should have acquired without deliberate forethought and practise?

I do not assert that images of the future movement are implied in that forethought, but I am not sure, by any means, that the case is, as yet, closed against them. It is just here that the next experiments need to be made.

VII. *Are Images Sensory?*—But though I am far from confident that images have no useful function in certain cases, I am fairly sure that their presence and value have been much overestimated. And this result I attribute partly to unsatisfactory analysis.

It is usual to include both "sensations" and "images" under the general description "sensory." Possibly we must do this, since we speak of visual sensation and visual imagery, of auditory sensation and auditory imagery, and so on; and, of course, sight and hearing are two of our senses. But the words "sensory" and "sensational" are dangerously alike, and we need to be most careful to distinguish images from sensations. One is apt to utter an impatient, "Of course," on hearing such an apparent truism.

An example or two may show, however, that the matter is not

quite so simple. "The water looks cool," we say. "Yes," runs the ordinary explanation, "we have frequently experienced coolness when we have touched things which look like that; so that, when we see water again, the visual sensation gives rise by association to the temperature image 'cool.'" But is it an image? "A man can hold a fire in his hand" while "thinking on the frosty Caucasus." And his hand will burn and his head will not freeze. But when we say, "The water looks cool," I venture to suggest that we feel the coolness in the same sense as we feel the appearance; one is as sensational as the other. If this analysis is correct, much experience that we have usually described as imagery will fall under the head of sensation.

Let me take another instance. Children, idiots, and some artists are said to be prone to colored hearing. This means that, whenever they hear certain sounds, these sounds give rise to certain images of color, which, as Professor Sully says, are so vivid that in certain cases they approximate to sense perceptions. (He probably means sensations.) How did these people learn these associations? Did they, for example, whenever they heard the note *C*, see something "red" and so, by constant experience, form one of Mill's "inseparable associations"? To ask the question is to answer it. Neither in the individual nor in the race can colored hearing be derived from the repeated conjunction in our perceptual experience of certain colors with certain sounds. Do these people imagine the colors or are they sensational? If we say that it is a question of imagery, this implies that, though not *experienced* in connection with the sound, the color is always imagined in connection with it. And this means, on the ordinary doctrine of sensory and ideational centers, a series of connections between the sensory center of one sense with the ideational center of another, without, apparently, at any time, any of these connections between the sensory centers of the two. If, however, we suppose that the color and sound sensory centers are not yet completely differentiated, if we suppose that colors and sounds are not yet altogether dissociated, we have an easier solution. "What has not been dissociated can not well be associated," says Professor Ward somewhere, and this seems to me appropriate here. One further question. From the psychological standpoint, which is that of the individual consciousness, are these colors like images or like sensations? They come when the sound comes, they go when it goes; they come abruptly, breaking in upon our trains of thought; they are not like images, hesitant, fluctuating, and largely dependent upon our effortful attention.

What, then, is the upshot? Again it is that something we call

imagination might better be described as sensation. We do not do this, because our psychology is overlaid with a metaphysic of copydom. The individualistic standpoint proper to psychology is deserted for a dualistic standpoint, in which emphasis is thrown on the external world. If, for instance, "red" is not there for everybody, when the note *C* is struck, it is said to be a product of imagination or, speaking more accurately, an image. A knowledge of the normal evolution of sensational change, even with an unchanged environment, will finally break down this habit of thought; but, at present, it is dominant. It swells still further and, I think, erroneously, the population of the realm of imagery.

"Yet, after all," I hear an objector say, impatient at this wire-drawn argument, "the image does not feel as the sensation feels. If it did, we could 'cloy the hungry edge of appetite with bare imagination of a feast.'"

It is precisely my argument that it does not; but that we have not, as it were, gone by our feelings; we have inferred images instead of having felt them.

There is one more case, a most important one, which Mr. McDougall deals with in his "Physiological Psychology," and which Professor Woodworth, though adversely criticizing, does not appear to have quite met.

I remember the thing best in learning billiards. "You try to form a unified kinesthetic percept," says Mr. McDougall, "of the positions you are taught to take up." (Some people would try much harder to get accurate visual percepts; but that is by the way.) But it is not clear whether the author thinks that one forms an image of that percept before one sets to work to take up those positions again. I incline to think he does; but he will correct me if I am in error. Now, for myself, so far as I can remember, after having, once or twice, been placed right, I started by myself putting my hand to form a bridge and holding my cue loosely with my fingers; and, if I was helped by any effect from previous kinesthetic impression, it was only in the feeling that now I had got it like last time. This, of course, is a stage of perceptual development which may be altogether prior to imagery. But it is for each trained observer to test the question for himself.

Try to image how some simple movements will feel or look; then do them, and ask yourself whether the sensations were what the image foreshadowed. And if the sensation seems to display the inadequacy of the prescient picture, if we can do what we intend, though not what we imaged, the case for the potency of the image seems weakened.

But the sensations, when they come, often do seem as if they were the actual filling-in of the image. Now I suggest that all those twitterings and twitchings which one feels when thinking about a movement one is going to make, and which are afterwards filled out, are not images, but sensations of incipient movement. Cut these away, and the great bulk of what people call their kinesthetic imagery will go by the board.

I have tried, with what success my audience must judge, to show that much that we are accustomed to call imagery is really sensational in character.

Do we never, on the other hand, confuse images and thoughts? Personally, I find it very helpful in psychological thinking to distinguish between "image" and "idea." The word "idea," I know, is very useful to the layman. He uses it with a width of signification which easily embraces image, judgment, ideal, conception, and he may also, if he is a bit of a philosopher, call his percepts "ideas" of things, which, in themselves, he can never know. The psychologist does it too. Even so careful a writer as Professor Woodworth[1] sometimes uses the words "image," "idea," and "thought" as if they were interchangeable, and I own myself guilty of using "idea" for "image."

I should like to relinquish the word "idea," but its hold is too great, and there is no word which we could satisfactorily substitute. We can, however, use "image" when we mean image only, and could retain "idea" for imageless thought. Of course, the idea is often accompanied by the image, but it is other than the image and can subsist without it. "Thought" is too wide to use at all unless qualified as perceptual thought, conceptual thought, and so on.

I have very little hope of persuading any one to accept these limitations of terminology; but I put them forward to this Society in order to obtain opinions on the question.

May I make one further distinction, namely, that between imagery and imagination? The one may be strong, the other weak. A man's mind may be full of ideas, he may persistently follow "the light that never was on sea or land," but he may not be able to image it.

And I wish to guard also against the confusion of imagery with that kind of spatial location of imaginary objects which appears to be so profitable pedagogically. Indeed, "imaginary objects" imply too much, "schematic local symbolism" is perhaps better; but in either case there need be no images.

I do not, for one moment, expect to get any large measure of

[1] "Garman Memorial Volume," pp. 352, 353.

assent for many of the positions advanced in this paper; my own views are not as clear and definite as when I began to prepare it. But if I have, in any way, helped to distinguish more definitely the "image" from "sensation" and from "thought," and if I have shown that its current application is too wide and its potency overestimated, I shall be more than satisfied.

W. H. WINCH.

LONDON, ENGLAND.

THE POWER OF MUSIC

IF one were asked to differentiate between music and the other arts, he would naturally turn first to the medium in which it is expressed. But there are distinguishing characteristics of quantity as well as of quality. While the other arts may show them to some extent, with music they are attributes of preeminent importance. We refer to the universality of the appeal music makes to man, to its versatility, and to its power. By the first we mean that music can claim for itself a larger and a more appreciative audience than any other art. Under the widest possible differences of race, natural intelligence, and education, music is effective in its appeal to the human mind either to stimulate it to crude and passionate reactions or, at the other extreme, to awaken the purest and strongest esthetic emotions. True, the character of the music appreciated varies with the different degrees of education and civilization to which the individual or the race has attained, but only seldom, if ever, do we find a person not susceptible to some element of music, to simple melody or to rhythm.

By versatility we mean the unique power music possesses to stimulate emotions of the most striking differences of mental coloring and bodily reactions. It can arouse enthusiasm, stifle bodily fatigue, instil courage and endurance, animate the mind with gayety, or calm it to religious worship and prayerful meditation. Whatever the emotion, whether of joy or of grief, of excitement or repose, of comedy or of tragedy, music has a note to deepen the feeling of sadness or to heighten the touch of joy. No other art can appeal to such an extended range of human emotions and touch them all with such a magical hand.

The third attribute of this, the strangest and most subtle of the arts, is its power. Not only does music appeal to the human mind widely, but it appeals everywhere strongly. No other art, with the possible exception of literature, can make the emotions so poignantly

real or so effectively oppose the dominance of some controlling mood. Upon this attribute of music the world has remarked, and, perchance, reflected, since the days when David took his harp to solace the heart of Saul, and the Greeks repeated the mythical story of Orpheus, how by his music he charmed the hearts of man and beast.

Yet while these attributes of the musical art have not escaped the notice of the world, but have been abundantly recognized and remarked upon by men of poetic, and of scientific, and of philosophic vision, but little—astonishingly little—has been done to explain them. Musical esthetics is, at the present time, not only the most obscure, but also the least developed subject in all the philosophy of art. To give an adequate explanation to the facts to which we have referred requires a more thorough psychological analysis of music and a more philosophical examination of the facts thus gained than has yet been made. However, pending this scholarly desideratum, we may remark upon these points with perhaps something gained toward an ultimate explanation. Let us state a little more definitely just what we mean by the power of music.

When we speak of the power of music, we mean that it has a way of forcing itself upon our attention as no other art has. It impresses itself upon our minds, so that we must give it audience and listen to its message. There are two ways in which this unique power of music manifests itself. In the first place, music is sensuously more impressive, more insistent, than any other art. Again, no other art, with the possible exception of literature as exemplified in the drama and the novel, takes hold so firmly of our emotional nature or stirs so deeply the nether strata of this side of consciousness. Can definite and plausible reasons for these facts be given?

There are three points we wish to present as throwing light upon the attribute upon which we have last commented. They are these: (1) The biological significance of sound, the medium through which music is expressed, (2) the organic character of rhythm, and (3) the dynamic character of the various elements of musical symbolism. Let us amplify these points in order.

As an art music gains greatly in impressiveness and in power by reason of the fact that it has for its medium of expression that sense stimulus which both psychologists and biologists are telling us is most intimately connected with the emotional life. An Italian psychologist only recently, seeking for an explanation of the close relationship between music and the emotions, has advanced the theory that the fibers of the auditory nerve are interlaced with the fibers of the pneumogastric nerve, connecting the emotions in this way with sound stimuli through the functioning of the vital organs.

Whether or not the theory be true, the fact which the hypothesis was meant to explain can not well be denied. Of this experience well assures us.

Biologists, too, impressed with this fact, from the time of Darwin and Spencer have not ceased to remind us, some in one way, some in another, that sound is the most natural and most effective way of expressing and communicating the emotions, and is, therefore, the most exciting form of sense stimulus. Spencer's theory of music, it will be remembered, is that music is but a development from the emotional outcries of our primitive ancestors. Here, again, we will leave the theorist to his theories, to work them out as best he can; it will suffice in this connection if we recognize the fact their theories are meant to explain, viz., that sound as sound is the most effective stimulus emotionally carried to the brain from any of its organs of perception. Common experience can here be appealed to also: the moans of a sufferer excite our sympathy and pity as his emaciated form will not; animals habitually silent in extremities of suffering or of distress give utterance to cries of the most intense expressiveness; animals as well as men habitually communicate various emotional states through tonal inflection or intonation. As a consequence, sound qualities have become indissolubly associated with emotional states, and have come to be the most exciting, that is, the most impressive, stimulus of sense. This natural impressiveness of sound, instilled and fixed in us by ages of development in which considerations of life and death were involved, is carried over from the realm of crude emotional outcries to the realm of music, and there functions with undiminished vitality. Here it manifests itself by giving to the mere sound qualities of music, harmonic factors such as harmony and discord and dissonance, the major and minor modes, timbre, and modifications of tempo and force, an influence over the mind almost hypnotic in its directness and power.

In mentioning the organic character of rhythm as one of the causes for the peculiar power which music exerts over the human mind, we do so to call attention to the fact that rhythm is primarily of the body, not of the mind. So far as we can now see, it is due to the metabolism, purely physiological changes, of the nerve cells. The accumulation of energy here is approximately uniform, while the nervous discharge is essentially explosive, a certain potential being required before the nerve impulse can overcome the internal resistance of the nerve tracts. Under such conditions the nervous discharge must necessarily be periodic or rhythmical.

If we accept this theory of rhythm, it follows that rhythm or susceptibility to rhythmic stimulation has become ingrained in the

very heart of that most vital of all vital substances, the nervous system, and functions there with all the compelling force of an instinct. This means much when translated into terms of impellent force or inherent power, for in proportion as an act is instinctive, that is, without consciousness of the end to be attained, the driving impulse, the *vis a tergo,* must be the stronger. By means of education and discipline man may place rational motives, high conscious purposes, over natural instincts, but in themselves and without years of training instincts would determine the activities of man as well as of animals. The impulse to play in the child is normally stronger than the impulse to do his tasks; the desire for wealth, the acquisitive instinct, even in spite of training is sometimes stronger than the cultivated habit of social regard. Education is easy just so far as we can take advantage of instincts to help us toward the desired end, and difficult just so far as we must oppose instincts which, having served their purpose, tend either to function still from their native strength or, having become half crystallized, to function as habits. Rhythm being organic, that is, inherent in the functional activity of the nervous system, possesses the force and clamant strength of instinctive activities. It may be blind, unreflective, and instinctive, but it is clamant, and intense, and strong.

As an element in music giving strength to the mental reaction music produces, it may be seen both in the crude, but intense, response of the primitive man to his rhythmic music and in the keen appreciation of the devotee to our best compositions. In the first case we see it in the war-dance, where the dancers are wrought up to an emotional intoxication or frenzy by the strongly accented and rapid rhythm of the drum or other instrument of percussion; at the other extreme it is exemplified in the characteristic response, refined and subdued, but nevertheless direct and full of power, given to modifications of rhythm and tempo in the different *movements* of our higher musical forms. Between these extremes it functions in various ways, but always, though it may be utilized as an intellectual factor, with a rich and instinctive emotional concomitant.

Our third point is psychological, and in order that its real significance may be appreciated it must be interpreted from that point of view. As it was stated, it affirmed that music gains in power because its elements and the symbolism it uses are inherently dynamic in character. Wagner evidently had adumbrations of this truth when, following the lead of Schopenhauer's philosophy, he affirmed that music was a direct expression of the universal will. Aristotle, also, much earlier must have partially realized the same truth when he asserted that music imitates most closely the inner

life of the emotions. The truth, therefore, is of ancient lineage, though for all of that it has never yet been very clearly formulated. Let us see just what it means and what it implies.

If we pause for a moment to enumerate what we have called the sense or impressive qualities of music, we shall see very readily how strong in them is the dynamic factor. Rhythm and tempo and modifications of force are surcharged with movement and energy, while even the more static elements timbre and harmony are so intimately bound up with the melodic or harmonic progression (note the word) that they, too, are deeply fraught with the same quality. We shall appreciate this fact better, perhaps, if we contrast with it the symbolism in which other art ideas are expressed.

The purpose of the artist, for example, is to choose some critical moment in the experience of his characters and to crystallize this moment for us in such a way that the sense qualities are pleasing and the thought content is significant. But in all the various forms of this art, in landscape, in portraiture, in genre painting, there is the total absence of this dynamic quality in the sense stimulus. In this sense painting is all "still life." It is true that in painting we find figures representing motion and expressive of the utmost activity and effort, but even in these there is wanting that real movement and action in the sense stimulus which we have seen is characteristic of all music. In Millet's "Sower," for example, the figure is replete with energy and action, but the effect of such a representation is, in intensity, distinctly below the effect of strong rhythm or modifications of force or tempo. When the artist has done all in his power, the feeling of energy and movement is still inferential, not a direct datum of sense. In this art there are only quiescent figures, unchanging color forms. Considered as sensible forms, the representations of this art are static; and the emotions are aroused, not by the close analogy between the character of the sense factors and the natural life of the emotions, but chiefly through an appreciation of the thought content. A painting from its very nature tends to keep the emotion aroused upon one unchanging plane rather than to develop it up to a climax; once I comprehend the artist's thought an appreciate his technique, there is nothing in the stimulus itself to carry on the emotional consciousness to a richer, fuller life. On the other hand, the emotions which have been aroused tend at once, by a well-recognized psychological law, to fade away because of the necessary monotony of the stimulus. It is true that through association the representation may be so enriched that the emotions will be carried on to a full and a very rich reaction. The point we wish to emphasize is not that such works of art do not stimulate the emo-

tions, but that they do not do it so directly as music; in the first case it is done principally through the thought expressed rather than by any dynamic suggestion in the sense stimulus employed.

Literature, on the other hand, well confirms our point as a positive example of the principles which give music its power. As Lessing long ago pointed out, literature is peculiarly adapted to express ideas in which there is development at successive mental states. Literature, therefore, ranks with music as an art adapted to carry the mind up to emotional climaxes, as, for example, in the drama or the novel. By means of conceptual representations presented in panoramic succession, that is, by the concrete imagery of language pictures or by certain types of thought, the emotions are awakened and stimulated and carried on to maximum degrees of intensity familiarly known as climaxes. It, like music, takes a deep hold upon the mind, therefore, because it conforms to the natural functioning of the emotional consciousness. But even as compared with literature the musical art in this respect stands superior. This dynamic similarity to the play of feeling, in music, extends down beyond the thought content even to the elements of its sensuous expression. In these sensuous elements themselves such as we have mentioned, as well as in the ideal content of music, we have an analogy, a dynamic similarity, to the emotions which, being sensuous, goes far to explain the clamant character and hypnotic power of this art.

HALBERT HAINS BRITAN.

BATES COLLEGE.

REVIEWS AND ABSTRACTS OF LITERATURE

Ralph Waldo Emerson: sa vie et son œuvre. Avec 3 phototypies hors texte. M. DUGARD. Paris: Armand Colin. 1907. Pp. 418.

A really notable contribution to the philosophy and teachings of Emerson by an able French teacher and writer is certain to interest the American followers of the sage of Concord. Mlle. Dugard is the author of several important books on philosophy and education, and she is a valued contributor to the best French reviews. Her study of American life and character ("La société americaine"), published more than a dozen years ago, brought her name favorably before our people.

Two chapters are devoted to Emerson as a man, one to his life, and one to his character and spirit; a chapter to his general ideas; a chapter to his view-points of the individual life as brought out in the essay on "Self-Reliance"; a chapter on the domestic life, in which Emerson's views on marriage and friendship are discussed; the fifth chapter notes Emerson's contributions to the discussion of social problems; the sixth,

his philosophy of religion; and the seventh, the nature of his genius as a thinker and the range of his influence as a philosopher and teacher.

The spiritual influence of the character and writings of Emerson is strongly emphasized. Mlle. Dugard regards the idealism of Emerson as one of the most potent contributions of America to modern thought. In this she likens him to Plato; and like the great Greek philosopher, she believes that he is one of the few great writers to whom future teachers will continue to revert for inspiration and direction. Emerson's strong individualism is emphasized and his great influence in this direction on the best tendencies of American civilization.

While recognizing the detached character of his forms of thought, she holds that he is eminently consistent as a thinker and that apparent contradictions are mere matters of interpretation. His foreshortened esthetic sense, and particularly his lack of interest in music and his deficiency of emotional warmth, are critically discussed and deplored. It may well be asked whether the author has made as careful a study of Emerson's poetry as she has of his essays. Surely the poems teem with the highest emotional reactions.

Students of philosophy and education in America owe a large debt of gratitude to Mlle. Dugard for this scholarly and exhaustive study of one of our first spiritual teachers. Her work has been carefully done, and shows not only intimate acquaintance with Emerson's writings, but familiarity with the entire field of American history and letters.

WILL S. MONROE.

STATE NORMAL SCHOOL, WESTFIELD, MASS.

The Raccoon: A Study in Animal Intelligence. H. B. DAVIS. *American Journal of Psychology,* October, 1907. Pp. 447–489.

The paper consists of two parts: (1) general observations of the habits and instincts of adult raccoons, and (2) an account of experimental work. The results of the latter portion only can be reviewed here.

The animals were allowed to unlatch the fastened door of a box, *enter* it and get food. Single fastenings, a "group" of two buttons, the same plus a vertical gate-hook, and, finally, two combination locks, each constructed of four of the previously learned single fastenings, were used. The combination locks demanded that their elements be operated in a fixed order.

Though no names (save imitation) for the animals' methods of learning are employed, the general impression given the reader is that Thorndike's experiments with cats have been confirmed in detail and that the raccoon's learning conforms to the trial and error type. Chiefly effective in conveying this impression are the following conclusions: The experiments show variety of attack at first and a single stereotyped method at the last for each animal. "The perfecting of the power of undoing fastenings is accomplished by a slow series of small changes consisting chiefly in the omission of unnecessary movements and the combination of

those required. Experience with former fastenings holds over in the case of new ones, leading the animal, at least in certain cases, to begin his attack at the place on the surface of the food box where he has been accustomed to work. (This has been found by Thorndike in the case of cats, but denied by Cole for raccoons)" (p. 486). Elsewhere the method of working the latches is described as a "tendency to the formation of a 'short circuit' by the elimination of useless movements." These conclusions are confirmed by the facts that no clear cases of imitation were found and that the deliberate behavior of the older raccoons corresponds with that of older cats. Add to this the facts that no tests of putting the animal through an act were made (no evidence appears that the animals could be handled at all by the experimenter) and that, as the experiments were arranged, an act was always, objectively at least, a necessary element of the association, and we see how forcibly the impression of trial and error learning is conveyed to the reader.

Consideration of the further results of the paper may indicate, however, that the trial and error learning did not occur theoretically pure. For "the learning curve for the raccoon follows closely the type of those found for the higher animals and *for man*" (p. 477). The latter fact was proved by giving combinations 1 and 2 to boys and girls to learn and plotting the curve. And the "curves for raccoons and for Kinnaman's monkeys seem to show a *nearly equal facility* in learning to undo fastenings." As this rate of learning is very different from that of cats, it deserves further comparison. Were the raccoons hungrier than the cats similarly tested? No, they were moderately hungry (pp. 463 and 465); the cats were "utterly" so (Thorndike, p. 6). Which animals are physically quicker? This is like asking which is physically quicker, a tiger or a bear? The rapidity of the learning discovered seems, therefore, partly a mental affair. Or, if not partly mental, then the raccoons learned by the method of the cats, which possibly have "*no images or memories at all*"[1] (Thorndike, p. 73), nearly as rapidly as monkeys which exhibit "at least a low form of general notion" (Kinnaman, p. 148). Not only this, but Mr. Davis has most carefully shown "that the order of procedure in working the combination locks was perfected before the amount of effort necessary was fully learned" (p. 486). Hence the raccoon learns "order" and "amount of effort" at two somewhat different rates in the same experiment. No doubt this may be due merely to the structure of the locking device. Had it been less difficult the manipulation might possibly have been perfected first and the order second, but even in that case the two rates would indicate that the learning was a complex, not a simple, process. It seems that with this experiment Mr. Davis has opened a field worthy of further investigation. Finally, the raccoons seemed to reach a sort of "*generalized* manner of procedure" which enabled them to deal more promptly with any new fastening, and there was an evident ability to respond to small differences in complex relations.

[1] Except in this case, the italics are the reviewer's.

The first of these groups of facts shows, then, that the raccoons learned by trial and error, while the second may indicate to the careful reader that some other factor also was present.

During the short periods of no practise the raccoons showed a gain in the facility with which they operated latches. This observation seems, to the reader, to be a neat laboratory verification of the remark quoted by James that "we learn to swim during the winter and to skate during the summer." Memory for combination locks was imperfect after a period of 286 days, but relearning was rapid.

One raccoon, having caught one of her toes between the vertical hook and the side of the food box, always thereafter released the hook with her nose. This interesting observation seems to support Yerkes's opinion that pain is, in some cases, a better stimulus than hunger.

An excellent table is given of the first forty trials of raccoon No. 1 with the single fastenings and groups. The generalized curves, however, are too much reduced and of the too common type which, if read accurately, must be copied on tracing paper and transferred to cross-section paper to determine the ordinates of any given trial. They readily give, however, a general notion of the time required for the learning process and show an interesting difference from monkeys, for which a like curve is given.

So far the experiments with fastenings. Experiments made to test the color perception of the raccoons seemed to indicate that they did not discriminate colors as such, but depended on differences in brightness alone for their successful reactions. The tables given tend to confirm this opinion or to show at least that discriminations of brightness are considerably easier for the animals to make than discriminations of colors.

The method employed for these tests, however, is open to serious criticism, for, with the first piece of apparatus used, the raccoons could both look into and reach into the vessel which contained the food and into the five similar vessels which were empty. The experimenter must have felt this disadvantage, for the second piece of apparatus "*did not allow the animal to look into the container in which the food was placed*" (p. 479), but the food could be secured by reaching through an opening 2″ by 1½″ in the vertical slides. The food was placed "under" one color, and when this was moved to a new position every other color was given a new position also. Thus with the second testing device each container could be explored by touch. If the animal reached into a no-food vessel, an error of color discrimination was recorded against him. There seems, thus, no means of distinguishing true errors of color discrimination from the cases in which the animal paid no attention to the colors at all, except that brightness tests gave better results than color tests. "The two pieces of apparatus were used indifferently."

The first piece of apparatus is almost identical with that used by Kinnaman with monkeys. The reviewer has used this apparatus with raccoons, and found that apparently they *could not pass a single food container without both reaching into it and looking into it.* Instead the

animal would go to one end of the row of vessels, explore the first one carefully by both touch and sight, then the next, and so on until the vessel with food in it was found, and then go on in the same way to the end of the row and then back again, rarely skipping a single vessel. Adult animals, such as Mr. Davis describes, skip more of the vessels, for one was considerably *above chance* in the color tests, and instead of 17 per cent. (chance) the brightness tests gave an average of 52 per cent. of right choices, while the best record of thirty brightness tests gave 96 per cent. of right choices. This marked difference between the average and the ability of one animal as shown by his best record may, perhaps, indicate the presence of a factor tending steadily to reduce the average of right choices, especially since brightness discriminations are not very difficult for the raccoon to make. However this may be, the raccoon has a strong instinctive impulse to investigate every opening by both touch and sight. Any one who has seen a hungry raccoon stop working for food to explore the trainer's pocket, and finally have to be torn away from it by force, will understand how apparently overpowering is this impulse to explore all openings by touch. One's cuff, foot of trousers leg, pockets, half unbuttoned coat, and all the feeding vessels were fatal provocatives of this reaction. Many mistakes in selecting the food container occur, therefore, because the animal can hardly pass by any container without exploring it. Since there is no difficulty in arranging apparatus so that the animal must select the vessel before he can either look into or reach into it, the influence of instinct in making the tests inconclusive could have been eliminated. Yerkes has shown, in the case of the crab, that a test which runs counter to a strong instinctive impulse is unsatisfactory.

No certain cases of imitation of one raccoon by another were observed, and while such cases "remain few and uncertain, we may well entertain reserve as to those where the raccoon seems to imitate the experimenter." Cole's explanation of such acts by raccoons is criticized and another proposed in which "accident," "inveterate impulse" (the instinctive impulse to claw at loose objects, we must suppose), and "association" are the words which are made to share, perhaps equally, in bearing the burden. To which it may be briefly replied that accident it was not, that the raccoon certainly has such an instinct, but the reaction in question is not an example of it, and that "association" is quite probably the proper word—but association of what? Since Thorndike's word "association" may be said to be, psychologically, a noun which requires an object. Used in the abstract the term explains nothing, but since association of a visual with a gustatory image is denied, the term, as used by Mr. Davis, must mean association of a motor impulse with a given situation, "stamped in" by trial and error alone. This explanation will not account for Cole's results since an *act* was not a necessary element of the association, but was merely a test of the presence of an association already formed, an association, too, between sensory impressions or images of sensory impressions.

When a bolt at the left of the door of the food box was removed

raccoon No. 5 "nearly wore himself out trying to push something from the place where nothing was present" (p. 467). In his scramble to do this he assumed the position of standing on his head, from the fourth to the eighth trial. Cole is quoted as saying that his raccoons "did not paw at the place where the loop had been nor did they claw at the loop or button when the door was open." On the evidence of the behavior of this raccoon No. 5, therefore, Cole's results are denominated as "*exceptional.*" The answer to this criticism is arithmetical. Cole's animals did claw at the side of the door where a latch had been *exactly six times* (Cole, p. 218). Now compare this number, six, with the thousands of trials in which no such thing occurred. What is the ratio? Or which is the exception and which the rule? Truly it is a startling experience to see a raccoon stand on its head, even four times. Yet the vividness of the experience must not be allowed to blind us to the evidence of our numerical records. Otherwise anecdotes would be as valuable as recorded tests in animal psychology.

Mr. Davis secured one animal which was blind, or nearly so. It is to be hoped that the sense of touch will be carefully tested in this animal for the opportunity is unique, and in this case no cruelty can be charged in blinding the animal.

It seems to the reviewer that in attributing to the raccoon a nearly equal facility with the monkey in learning to operate fastenings, the former animal is rated considerably too high. For Mr. Davis included in the recorded time only "the entire period during which the animal was *in contact with the locking device*" (p. 465), while Kinnaman counted the time "no matter whether the monkey was before or behind the box, whether prancing around it or jumping up and down on top of it, so long as he was trying to open it. Some of these efforts were in nowise directed toward the latch" (Kinnaman, p. 115).

Though all the raccoons tested by Mr. Davis were fully grown, or nearly so, he found considerable difference in the behavior of the younger and older individuals.

Notwithstanding differences of opinion as to the interpretation of results, which differences seem inevitable and which future experiments will settle, Mr. Davis has given us a valuable and permanent contribution to the data of comparative psychology. With indomitable purpose he has overcome most serious difficulties both in securing raccoons and in carrying out the experimental tests. In addition to the immediate value of his results, they should attract other workers to investigate the problems which he has shown to be worthy of further study.

L. W. COLE.

STATE UNIVERSITY OF OKLAHOMA.

JOURNALS AND NEW BOOKS

RIVISTA FILOSOFICA. January–February, 1908. *Il nuovo individualismo religioso* (pp. 1–27): N. FORNELLI. – In contrast to tendency toward social control, there is the disposition to leave religion more and more to the individual. Yet organization here might be effective. It is made difficult by the indifference of ignorance and the indifference of culture. *La coscienza negli animali* (pp. 28–51): A. FAGGI. – A discussion of theories of Loeb. To ask whether an animal has consciousness is to ask whether it has the mechanism required for associative memory. Exception is taken to Loeb's declaration that consciousness is merely a metaphysical concept without scientific justification. *La psicologia della esperienza indifferenziata di James Ward* (pp. 52–83): A. LEVI. – An account of the psychological theories of Ward, which are hardly known in Italy. (To be continued.) *Un trattato elementare di filosofia indiana* (pp. 84–109): L. SWALI. – A translation for the first time of the "Tarkâmrita," with an account of its position in Indian philosophy. (To be continued.) *Vita morale e vita sociale* (pp. 110–128): E. MORSELLI. – (Continued.) Morality has evolved from primitive uniformity to individual diversity. One of the most important philosophical problems is that of the relation between moral consciousness and moral philosophy, between which there is the contrast as between art itself and the philosophy of art, to use Rhiel's comparison. *La dottrina della proprietà nel Montesquieu* (pp. 129–135): R. MONDOLFO. – The concepts of property and liberty become practically identical when regarded as proceeding from the idea of personality. Their identification was natural under social conditions of the eighteenth century, and it is remarkable that Montesquieu ("Esprit des lois," XV. and XVI.) puts them in opposition. The opposition results from theory of social contract. *Articoli di riviste straniere. Notizie e pubblicazioni. Per Roberto Ardigò. Sommari delle riviste straniere. Libri ricevuti.*

Bloch, Leon. *La philosophie de Newton.* Paris: Felix Alcan. 1908. Pp. 643. 10 fr.

Ewald, Oscar. *Kants kritischer Idealismus als Grundlage von Erkenntnistheorie und Ethik.* Berlin: Ernst Hofmann & Co. 1908. Pp. ix + 314.

Gaultier, Paul. *L'idéal moderne.* Paris: Hachette & Cie. 1908. Pp. 355.

Robin, Leon. *La théorie platonicienne des idées et des nombres d'après Aristote.* Étude historique et critique. Paris: Felix Alcan. 1908. Pp. xvii + 702. 12 fr. 50.

Ross, Edward Alsworth. *Social Psychology.* New York: The Macmillan Co. 1908. Pp. xvi + 372. $1.50.

Störring, Gustav. *Mental Pathology and Normal Psychology.* Translated by Thomas Loveday. London: Swan, Sonnenschein & Co. 1908. Pp. 298.

NOTES AND NEWS

PROFESSOR A. C. ARMSTRONG, of Wesleyan University, contributes to the June issue of the *Educational Review* an article entitled "A Neglected Discipline." It is a suggestive plea for courses in the history of intellectual progress. "The stages in the advance of mind are counted turning-points in history, and the principles developed in them the foundations on which the edifice of later reflection must be based. The modern state, the new religion, educational reform, social betterment, larger views of duty and of conduct,—all are held dependent on conclusions to which the slow progress of the human spirit has led up. And yet by the great majority these fundamental conditions of civilized existence are less often made the subject of systematic reflection than of incidental reference. By the method of critical inquiry we study other questions in all the various departments of knowledge. The principles of thought itself, and the course of its development, are often left without inquiry; because we take for granted that we understand them, each man or sect or party appealing to them as best may serve the moment's need. The neglect becomes the more remarkable when it is remembered that the modern university pays no more attention to this central discipline than is given to it by individual men. Laymen may be excused for accepting without examination the postulates of modern thought as they are borne in on them by the spirit of the time. Scholars, on the contrary, may fairly be expected to consider the principles on which thought proceeds, and the elements in their reflection which they receive by the inheritance of birth and training. And by scholars this reasonable expectation is in part, if only partially and incompletely, met. But the responsibility of either class is less by far than the obligation of those highest teaching bodies whose function it is at once to inform and to direct the mind, to bring it into living touch with the work which the thought of the past has accomplished, to guide it in its task of making contribution to the solution of the problems still before the world."

THE editor of the *Revue de philosophie* invites, in the May issue, discussion of the problem of knowledge. It is interesting to note that, apart from the general importance of the problem, he finds special reasons for its timeliness in the controversies aroused by pragmatism and by the modernist movement in the Roman Catholic Church. "Les modernistes," he states, "s'appuient sur une théorie de la connaissance. L'Église leur dit qu'elle est fausse, ils répliquent qu'elle est vraie. Inconciliable avec la religion catholique, aux yeux du chef même de cette religion, le pragmatisme est encore inconciliable, d'après M. Poincaré, avec la science."

AT a recent meeting of the Board of Directors of Washington University, St. Louis, Dr. Charles E. Cory, who has been acting assistant professor of philosophy during the current year, was put in charge of the department of philosophy.